In the matter of 2011 Rulemaking on Appliance Efficiency Regulations	)))	**Docket No. 11-AAER-1**
Implementation of California Code of Regulations, Title 20, Section 1601 through Section 1608	)))	**Rulemaking Proceedings on Appliance Efficiency Regulations**

October 7, 2011

Comments of the Information Technology Industry Council
1101 K Street, NW, Suite 610, Washington, DC 20005

The Information Technology Industry Council (ITI) welcomes the opportunity to comment on this important undertaking by the California Energy Commission (CEC).

The ICT industry is committed to advancing policies and practices that help drive sustainable economic growth across every sector of our nation's economy through the effective use of ICT-enabled energy efficiency and clean energy innovation. Our technology is revolutionizing how businesses, consumers and governments decrease their carbon footprint worldwide through smart homes, smart buildings and smart grids. For every one kilowatt-hour (kWh) of electricity used by ICT, an estimated of 10 kWhs are saved in the overall economy, a significant return on the investment. Moreover, the use of smart technologies could reduce U.S. CO_2 emissions by as much as 22 percent by 2020 – a cost savings of $240 billion. Globally, the effective use of ICT has the potential of reducing CO_2 by as much as 15 percent.

To achieve these outcomes, ICT manufacturers need a policy environment that encourages innovation by providing flexibility to develop solutions that achieve essential environmental objectives while also addressing the considerable demands of a vibrant and competitive marketplace. It is with this in mind that we offer the following comments and recommendations in response to the rulemaking referenced above.

Innovation

The American Council for an Energy-Efficient Economy, in a February 2008 report, looked at the impact of ICT on the energy efficiency of the US economy. The ACEEE report highlights the nexus between ICT and energy intensiveness of the US economy:

> "Information and communication technologies (ICT) have transformed our economy and our lives, but they also have revolutionized the relationship between economic production and energy consumption."[1]

The ACEEE report, authored by economist Skip Laitner, took a top-down, econometric approach to evaluating the energy and climate impact of ICT. Examining the trends of ICT proliferation and the energy-intensity of the US economy, the report concludes:

> "For every extra kilowatt-hour of electricity that has been demand by ICT, the US economy increased its overall energy savings by a factor of about 10….The extraordinary implication of this finding is that ICT provide a net savings of energy across our economy."[2]

A subsequent US assessment of the climate change mitigation potential of ICT, undertaken by The Boston Consulting Group and based on cost-curve analysis done by McKinsey, estimated that ICT-enabled solutions could reduce overall national annual CO2 emissions up to 22 percent as compared to business-as-usual projections for 2020.[3] Even at the low end, this estimate underscores that ICT solutions can play a huge role in addressing climate change, relative to other solutions sets that are available.

The global potential for ICT-enabled solutions also is significant. The Climate Group and the Global e-Sustainability Initiative in 2008 produced a report entitled, *Smart 2020: Enabling the Low-Carbon Economy in the Information Age*, that found that ICT strategies could reduce global carbon emissions by up to 15 percent in 2020 against a business-as-usual baseline projection.[4]

In California, ICT will provide the enabling technology to support the state's efforts to achieve its energy efficiency and climate goals including zero net energy residential buildings by 2020, and zero net energy commercial buildings by 2030. Based on current studies, 40% of building

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1 Laitner, Skip, *ICT: The Power of Productivity*, American Council for an Energy-Efficient Economy, February 2008.

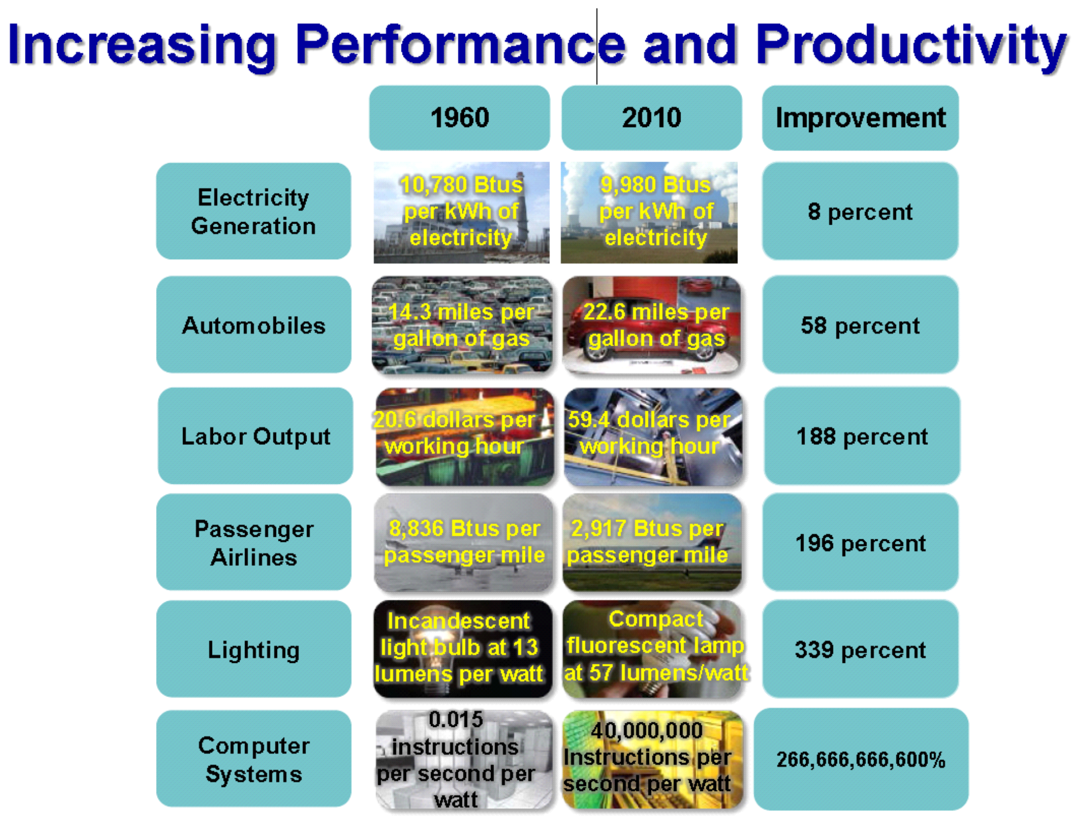
2 Ibid.

3 The Global e-Sustainability Initiative and The Boston Consulting Group, Smart 2020: Enabling the Low-Carbon Economy in the Information Age, United States Report Addendum, 2008.

4 The Global e-Sustainability Initiative and The Climate Group, *Smart 2020: Enabling the Low Carbon Economy in the Information Age*, 2008.

energy consumption could be removed by implementing operating and ICT technologies such as energy management systems.[5]

Meanwhile, the advances made over the last three decades in improving the productivity and energy efficiency of ICT products dwarfs that made in other industries. The chart below demonstrates the relative energy efficiency gains made over the last 30 years using measure of energy input and work output appropriate to each.



Source: Skip Laitner, ACEEE, various calculations, January 2011

All of the major subcategories of computers are improving energy efficiency along the same lines as Moore's Law for semiconductors, doubling computing performance per Watt roughly every 18 months. With the demands for data creation and transfer growing exponentially, it is imperative that technology growth and innovation continue unabated if we are to minimize the impact to energy requirements. Client computers have already reduced their energy consumption from 350kWhr to under 100kWhr while increasing compute capacity nearly 10x. Servers are increasing data center efficiency providing over a 5x capacity increase in a smaller energy footprint every 3-4yrs. Server systems are also becoming increasingly capable at virtualizing workloads, enabling a single, higher-powered server to perform the work of many

[5] Gartner, Inc. *Hype Cycle for Sustainability and Green IT, 2011*. ***See*** http://www.gartner.com/DisplayDocument?doc_cd=214739.

smaller servers and significantly reduce the overall space and power-use footprint of data center operations.

ITI believes that regulations of computer systems to increase energy efficiency are unnecessary. More significantly, regulations may induce unintended consequences and unnecessarily delay the adoption of efficient technology. Even adopting existing regulations from other regions could have unintended consequence in that the additional cost and program requirements could end up increasing the price of more efficient systems and thereby limit their sales, thus defeating the intent. Driving end users to retain old technologies inherently slows down innovation adoption and hampers proven energy efficiency methods such as consolidation in the data center and multifunction integration for client systems.

ICT has been at the forefront of efficiency improvements within the high tech industry as well, spurred by self-driven energy efficiency innovations such as

- the rapid decrease in the energy consumed per transistor
- standardized compute states
- power management modes
- battery technologies and capacity
- efficient AC/DC conversion
- adaptive intelligent system management
- thermal management
- DC distribution, virtualization
- de-duplication
- network resiliency
- equipment security, and
- LCD/LED display conversions.

Some studies indicate that computer energy efficiency has doubled every 1.57 yrs and may continue at this pace for the foreseeable future.[6] The key point is that significant progress has been achieved without government policy intervention. It is critical to carefully weigh the potential impact and consequences of policies and regulations intended to address energy consumption of ICT technologies.

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[6] Koomey, Jonathan G., Stephen Berard, Marla Sanchez, and Henry Wong. 2011. *Implications of Historical Trends in The Electrical Efficiency of Computing*. IEEE Annals of the History of Computing. vol. 33, no. 3. July-September. pp. 46-54

Overall trends in energy efficiency gains for computing equipment and data centers have steadily improved year over year at a pace consistent with the semiconductor technology trends referred to as Moore's Law. In fact, despite the warnings of a 2x growth in datacenter energy usage in the "business as usual" case presented by the U.S. Environmental Protection Agency in its 2007 report to the U.S. Congress,[7] a recent study has concluded that energy demand growth has slowed from 2005 to 2010 due to a number of factors, including improvements in the software such as virtualization, servers power management, energy proportional computing, and infrastructure improvements led to Energy demand decline.[8]

Technologies that enable cloud computing and virtualization have the potential to greatly improve the energy and material efficiency of IT data center services. In fact, a recent industry analyst report identified these technologies as potentially transformative sustainability technologies for organizations as well as the greater economy, along with carbon capture and sequestration, and the hydrogen economy, but with a much earlier mainstream adoption anticipated.[9]

As the various economies recover or grow, technological improvements are the driver for greater productivity while minimizing the holistic data center energy footprint. In a recent study of a top 100 business data center in the U.S., 32% of the servers in the datacenter were 3yrs or older systems and consumed 60% of the IT energy. Though these old servers consumed 60% the energy they contributed only 4% of the work delivered to business. Over 90% of the productivity was delivered by the new servers which only consumed 35% of the IT energy. For this particular study 60% of IT energy budget could be saved or re-provisioned. The study demonstrates a basic process for energy efficiency in the datacenter:

1) **Unplug** old, inactive and/or comatose servers
2) **Refresh** servers with new technology to take advantage of the doubling of efficiency every 1.57yrs
3) **Consolidate**. Conduct more of the work on a smaller set of servers. For growing businesses this may mean rapid increase in productivity within a provisioned energy footprint.

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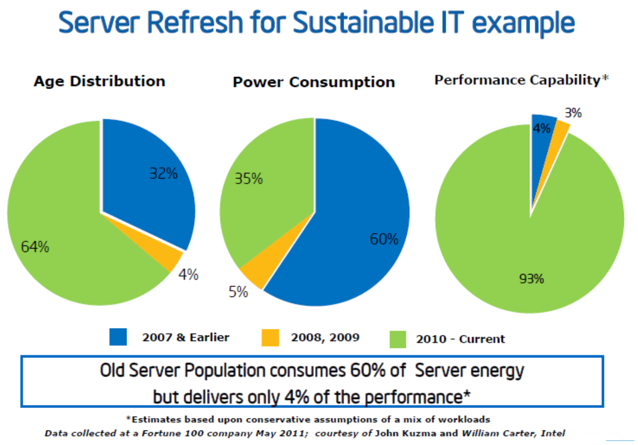
7 U.S. Environmental Protection Agency. *Report to Congress on Server and Data Center Energy Efficiency Public Law 109-431. August 2, 2007.* ***See*** **Report to Congress on Server and Data Center Energy Efficiency Public Law 109-431.**

8 Jonathan Koomey. *Growth in Data center electricity use 2005 to 2010*. Oakland, CA: Analytics Press. August 1. ***See*** http://www.analyticspress.com/datacenters.html.

9 Gartner, Inc. *Hype Cycle for Sustainability and Green IT, 2011.* ***See*** http://www.gartner.com/DisplayDocument?doc_cd=214739.



Public/Private Partnership

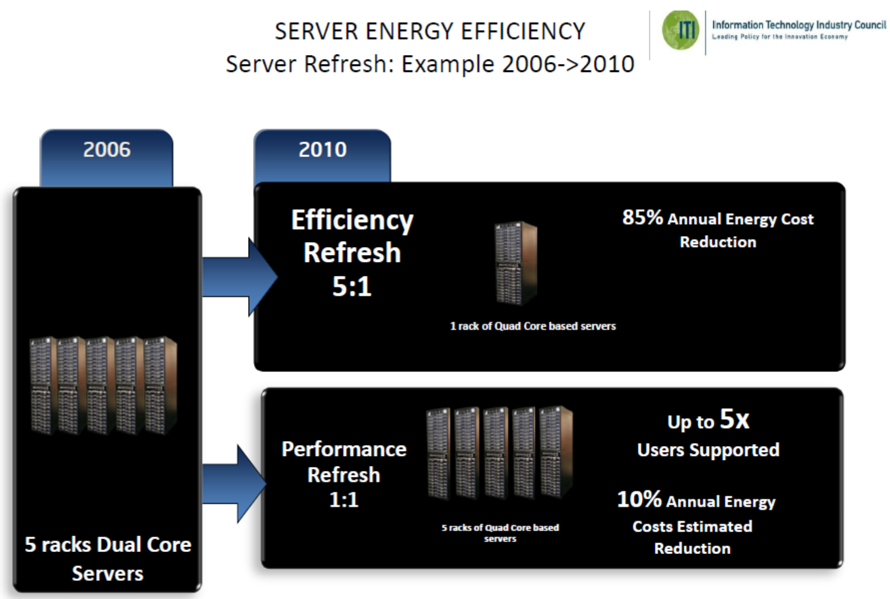
The U.S. government has been an important partner in achieving the innovations described above. The U.S. ENERGY STAR program has helped spur the marketplace. The investment of research and development monies by the Department of Defense and other key agencies has helped catalyze key innovations, and we are supportive and excited by new investments by the Defense Department on smart micro-grid and facilities energy design, control, and management. But most relevant to the CEC is the work being done on energy efficiency innovations by the U.S. government – and other governments overseas – in partnerships with our industry and other stakeholders. This includes projects such as The Green Grid (TGG) and European Union's Data Center Code of Conduct,[10] which provide the framework to review and attain energy efficiency across the data center.

Since there is no single solution applicable across the varied applications, businesses and usage models, TGG promotes a range of best practices, application guidance, tools, training and peer review assessments that can be molded to fit a specific data center situation. TGG's holistic approach reviews more than just servers, recognizing the importance of integrating ICT equipment with the cooling infrastructure in order to minimize energy use across the datacenter. The practices and processes cover infrastructure such as TGG's Power Usage Effectiveness (PUE) metric,[11] computer systems such as power management techniques on servers, advances in software driven storage technology such as de-duplication and tiering techniques, and networking.

Within the server and datacenter ecosystem there is a need to create tools and practices to evaluate, monitor, integrate and manage environmental conditions, ICT (compute, storage, and networking) provisioning, and energy provisioning. The development and use of these tools

[10] European Union. *Code of Conduct on Data Centres Energy Efficiency, Version 1.0.* Ispra, 30 October 2008. ***See*** http://ec.europa.eu/information_society/activities/sustainable_growth/docs/datacenter_code-conduct.pdf.
[11] ***See*** http://www.datacenterknowledge.com/archives/2011/05/10/uptime-institute-the-average-pue-is-1-8/.

within TGG and its liaisons, and the equipment features to support them, are critical pieces to the advance of energy efficiency across the datacenter. There are many examples where some of these techniques have been applied to gain efficiency in the datacenter, despite the fact that such operations and compute configurations vary widely across those data centers.



Source: ITI Energy Star Working Group

In recent examples of energy efficiency with this holistic approach, HP worked with the CA Department of Water Resources to consolidate their data center of 600 old servers to 160 current day servers in a virtualized environment. IBM recently conducted 5 refresh and consolidation projects in their Silicon Valley facility saving hundreds of MWh per year. These projects illustrate the capabilities that exist within currently available systems to dramatically reduce the number of servers required to deliver a workload through consolidation and increased utilization of a limited set of equipment. Regulations on any individual computer system or aspect of the data center would have placed restrictions, stalled or prevented these activities from occurring.

As an example of tools, TGG's PUE metric has become the de-facto standard of infrastructure measurement, and is responsible for the industry wide push reducing PUE from over 2.5 to nearly 1.8. That's a 30% reduction in wasted infrastructure energy by providing tools and methods to gain free-air cooling, improved thermal isolation, and other techniques where applicable. The broad array of industry experience and technical skills and their understanding of the varied conditions in a data center have enabled TGG to develop metrics, white papers, and guidance to promote this higher level of energy efficiency in the datacenter. TGG has also been focused activities specifically on servers to provide a similar set of metrics, tools, and practices to that will provide data center operators the metrics need to advance energy efficiency across the varied server configurations and architectures that reside in a modern data center.

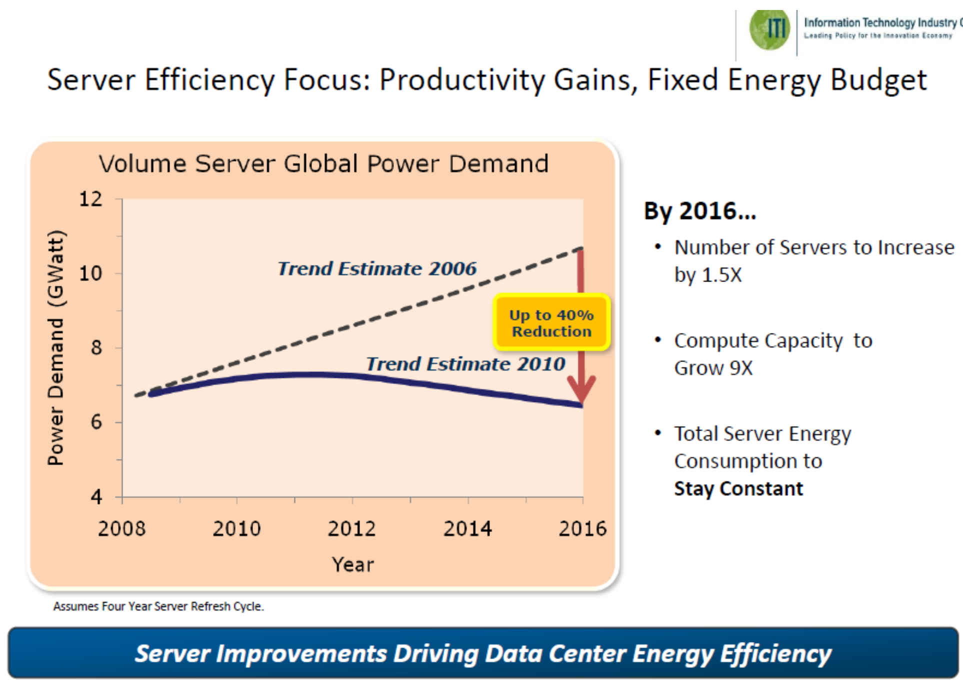
With an end user group that independently reviews and advises on the practical challenges in the data center, TGG has become a venue to provide a broad range of manufacturer agnostic tools to advance energy efficiency in the data center. The liaisons and collaborative work with industry groups such as SNIA, Uptime and Data Center Dynamics, academic and research organizations such Lawrence Berkeley National Labs, and international organizations provide a collaboration environment with some of the most advanced technology leaders in the industry. If the CEC and key stakeholders are interested in pursuing energy efficiency in the data center through the application of currently available energy efficiency capabilities on servers, we recommend stakeholders engage directly with organizations such as TGG or establish a comprehensive program that would complement the holistic approach being pursued.

The biggest energy reduction opportunity resides in virtualizing and consolidating server and storage equipment and implementing thermal management best practices in data center spaces. The Commission should work with TGG and the utility industry to design an aggressive training, education and incentive program to drive meaningful transformation to virtualized, and thermal managed data centers in California. This is the real energy savings opportunity that the Commission can begin implementing today.

Server Energy Efficiency Trends

There has been continuous improvement in energy efficiency on servers covering software, hardware, and integration with data center operations. Some examples include:

- Software:
    - Virtualization and/or compute work load aggregation
    - Multi-server management
- Servers:
    - Improving compute proportionality
    - Increasing productivity within market driven energy envelopes,
    - Autonomous power management
    - Policy driven power management features.
- Integration to the data center facilities:
    - Monitor and manage based on environmental conditions
    - Thermal controls such as variable fan speed control,
    - High temperature operations,
    - Electrical load capping
    - Dynamic energy provisioning



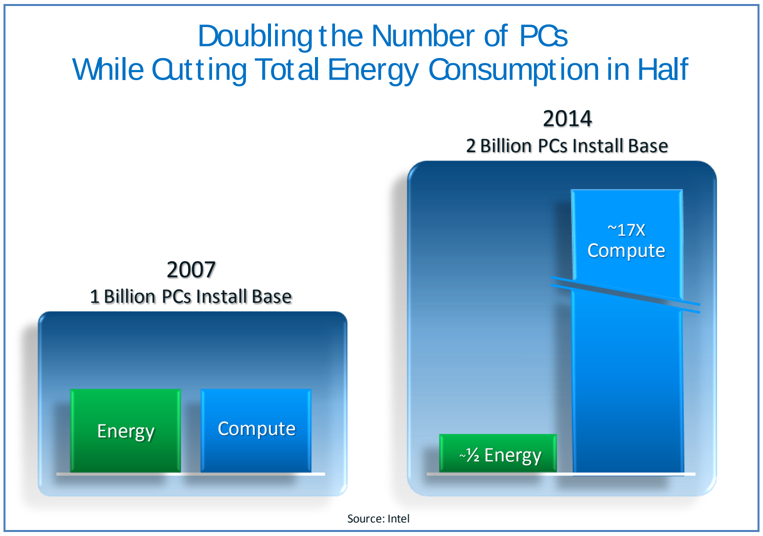
Client Computers Energy Efficiency Improvements

Client computer systems are already enabled to advance energy efficiency, driven by power management adoption as well as usage model and advances in technologies such as battery, displays, communication, and human interfaces. Overall, there have been higher levels of integration, replacing single function tools with more integrated and mobile units. The usage model is also evolving, pushing increased personal productivity and efficiency by enabling a shift to lower power devices that better match their computing capacity needs. The industry has worked with various agencies to develop standards for efficiency while still encouraging the holistic efficiency approach.

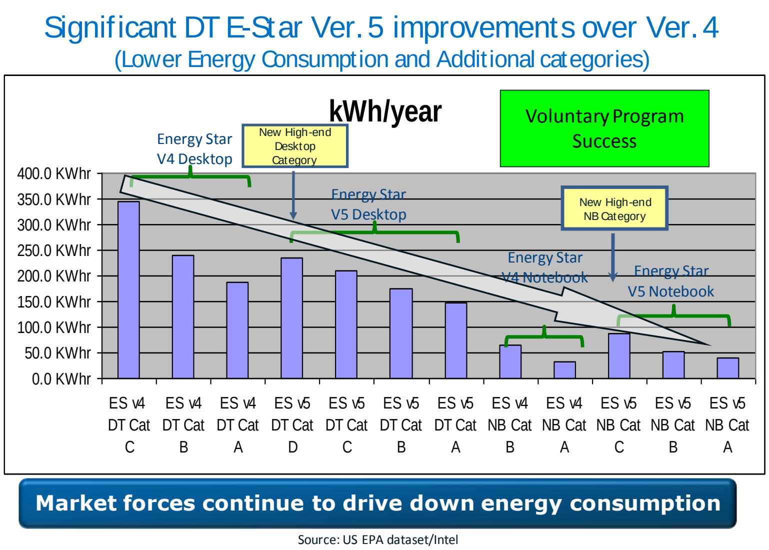
The industry's approach is in three areas:

1. Energy efficiency gains while continuing to driving innovation (fig.1). Industry factors:
    - Market segment/consumer demand
    - Competition
    - Caring for the planet – product energy footprint reduction through technology innovation[12]

[12] As one example of the carbon footprint reductions occurring in the latest technology from ITI member companies, AMD reported up to a 40% carbon footprint reduction with their current generation processing technology, when compared to their previous generation technology.
http://www.amd.com/us/press-releases/Pages/apu-carbon-footprint-2011jan27.aspx



2. Support voluntary programs to incentivize product energy efficiency in specific product categories. These programs continue to show strong record of success in driving down overall product energy (TEC) footprint. Not only on the targeted products but products which reuse similar components.



3. Global effort: Industry is driving Global Energy Efficiency Convergence of product energy efficiency regulations and standards, with applicability for voluntary and mandatory programs. This will enable energy-efficient ICT products to be cost-effectively deployed to both save energy and promote economic growth.

Computer Energy Efficiency Trends

There has been continuous improvement in energy efficiency on computers covering software, hardware, and integration with data center operations. Some examples include:

- Software:
  - Operating systems optimized for power management
  - Application software
- Hardware:
  - Form factor minimization
  - Platform optimizations
  - Proxy technologies
  - Intelligent network devices
  - Dynamic power savings technologies
  - Multi-core processors
  - Integrated product designs
  - Specialized function hardware
  - Remote system management

The ICT industry has pursued power management technology since 1995. More recently, significant advancements have been achieved leading to autonomous advanced power management methods when not in use. Modern systems respond quickly, thus allowing rapid wake-up without keeping the machine in full operation all the time. These advancements require technology integration across all aspects of the system such as firmware, operating system, application software, hardware, wake technology, and remote system management.[13] The overall advancements in power management and battery technology have also extended use of modern notebooks while on battery power, to levels of approximately 10-12 hours on a single charge. Properly configured desktop computers with a modern Operating System, updated software/firmware, and using network proxying technology, are capable of a significant reduction in the time that a PC will spend in the active mode.

Knowledge of today's computer technology suggests a need to reevaluate the assumptions that are used to calculate computer duty cycles and energy consumption values. Potential power savings identified in calculations may already be available, based on technology that is now being introduced to the market.

[13] It should be noted that some of the data presented at the workshop was collected in 2009 or earlier. Hence, some of the suggested energy savings have already been captured by systems containing current technology.

Unintended Consequences with Regulations on Computers

The computing hierarchy operates through the interaction of several key equipment types: client computers, computer servers, storage systems, and networking equipment. Within given computing systems, the configuration, integration and overall capability of the applied equipment types will depend on the needs of the application type and the requirements of the targeted use. Though many computing devices can perform thousands of various tasks, it can only be as effective as its ability to interact and communicate with the other devices in the system; these interactions will define the productivity and efficiency of the system, and its energy impact to the power grid. In an example system, companion devices such as tablets provide mobile media consumption; home computer systems provide personal content creation and review; wired and wireless networking provides the system communication, enabling distribution and exchange of the content; front-end servers may handle the communication requests; mid-tier servers may be used to manage, create and deploy new content; and even more capable larger systems may be used to conduct research and intelligently aggregate the information.

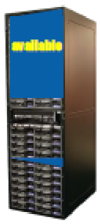
The efficiency and energy impact of any one system in the compute fabric should not be assessed without recognizing its impact on the computing structure. For example a regulation that restricts the energy and capability of all client systems may limit content creation, inhibit communication, drive the use of specialized systems, or increase the energy footprint of other parts of computing fabric. The use of additional devices, necessitated by limits on one of the system, would increase the overall energy footprint required to achieve the activity.

As noted previously, regulations or prescriptive requirements on computer equipment can lead to energy inefficient unintended consequences, such as prescribing low power servers which may result in a larger energy footprint in the data center and stall data center consolidation efforts. An example of this is provided in the figure below. For client computer systems, unintended consequences result from such items as promoting low power systems that discourage integration or greatly prolong the time required to complete active power tasks, and increases the plug load in the household or prescribing power limits that renders sleep as an annoyance mode, causing consumers to deactivate power management and keep their systems active.

Which is more efficient? (4 Socket Comparison)

Individual Server A	
Max Power	663 W
Idle Power	336 W
Capacity	334.3 Kbops/system

Individual Server B	
Max Power	715 W
Idle Power	358 W
Capacity	411.7 Kbops/system



To meet IT Requirement of 5.0 Mbops

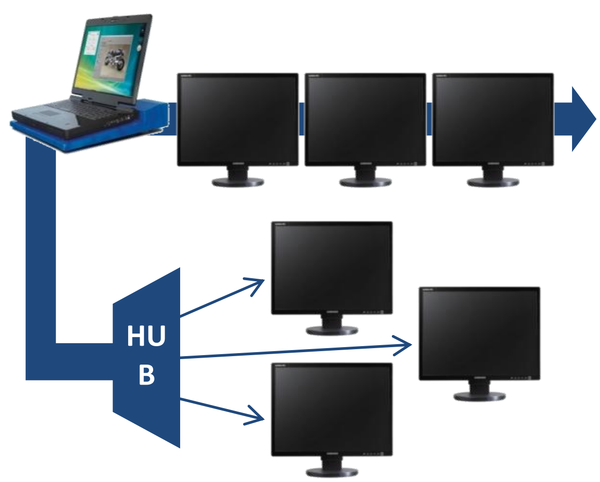
Rack A		Rack B	
Capacity	5.02 Mbops	Capacity	5.35 Mbops
Systems	15	Systems	13
Total Idle	5.04 kW	Total Idle	4.65kW

Choosing Server B is MORE Efficient
Saves 4.54 MWhrs to 3.73 MWhrs per yr.**

Courtesy of Intel Labs. Comparison data on production 4S systems available in 2008. Bops= Business operations per second as measured by Specpower_ssj2008. Savings estimates are based on 15-50% utilization.

What is more efficient?

Running multiple notebook computers, or using one notebook computer with a single discrete graphics processing unit to power up to four-six displays for consumer, academic, engineering, architecture, health care and productivity applications



Source: AMD

Additionally computer technology scales overtime, where a new technology is introduced and then gets better, cheaper, faster and lower power over-time. A great example of this technology scaling is the MPEG-4 technology used to encode and delivery high quality video. When first introduced in 2001, MPEG-4 would only work on the fastest highest performance, highest power computers of the time. But with Moore's law doubling of transistors, performance and the inherent increase in energy efficiency, we can now use MPEG-4 technologies on our battery powered phones to take videos, play them on our phones and share them through email.

A regulation in 2000 limiting power of computers could have stopped MPEG-4 technology from being introduced, and then scaling to levels that allow it to be used across a wide variety of information technology devices (computers, phones, tablets). Technology needs the ability to scale over time. This is how the industry functions.

Power Supplies

One of the logical places to seek to improve the energy efficiency of computers and computer servers is to examine the efficiency of their power supplies. Over the last decade, the efficiency of this fundamental component has significantly improved, with most servers using supplies that demonstrate in excess of 80% efficiency. While the push for higher efficient power supplies has been helpful in driving overall energy efficiency, most designs, especially multi-output power supplies, have approached diminishing returns. While more improvements can, and doubtless will, occur in server power supplies, it is important to note that incremental improvement to the current levels will require increasingly more time to develop, integrate to systems, and gain market adoption. In addition, these improvements, (above 90%) add significant cost to these supplies for relatively small improvements. Attaining higher efficiency beyond current standards is unlikely to be economically viable given the limited return on investment in energy savings verses the costs and small incremental gains.

There is an emerging trend in the power configurations for servers that would scale the size/capacity of the supply to the existing system configuration, right-sizing the power supply. The technology provides the ability to scale both the size/capacity of the power supply as well as its level of redundancy to match the planned use of the system. In other words, buyers who do not intend to deploy maximum configurations increasingly have the option of choosing a “right-sized” power supply at the time of purchase. This also allows customers who require larger systems to scale up individual configurations efficiently, avoiding the need to deploy multiple smaller systems which may not be efficient in handling their workloads. Though customized (right-sized) power supplies is a known method of maximizing efficiency, these have been costly and economically infeasible. The technology to right size power supplies post production is being developed. In a similar manner, the use of redundant power supplies is optional in many configurations, allowing the data center operator to determine the best way to achieve the high availability goals of their businesses. However, regulations that simply look at conversion efficiency at fixed capacity would impact and potentially stall the proliferation of these technologies.

Over the last several years, there have been other significant improvements in the energy efficiency of servers and other ICT equipment. In order to provide the power needed to drive the increased capabilities of this equipment without increasing the overall energy use of the system, more efficient and intelligent components have been designed into these products. Particular emphasis has been placed on the efficiency of the components used to regulate and convert power for use by motherboards and peripherals. While improved efficiency system level efficiencies can be achieved, individual component power levels may not demonstrate change. As a result, the best way to encourage advances in energy efficiency is to monitor the system level energy and leave the flexibility at the component level to allow innovation occur.

From an IT equipment standpoint, currently available computer and server systems offer power management functions and virtualization capabilities. These capabilities allow computers to spend more time in low power states, and enable data center operators to increase the utilization and quantity of workload delivered by a server system while reducing its idle time and also reduce its power by 30 to 60% when no workload is present. From a cooling system standpoint, there are a variety of thermal management systems, several promoted by Pacific Gas & Electric and Southern California Edison through their efficiency incentive programs which can substantially reduce cooling requirements. Rather than setting regulations for server products, it is likely that the best results and the greatest reductions in the use of energy may be driven by developing and promoting programs that provide education and/or incentives for data center operators to accelerate acceptance and deployment of these capabilities.

If Further Regulatory Activity is Pursued

If the CEC decides that there are grounds for further regulatory activity for either client computers or servers irrespective of the arguments offered above, ITI strongly recommends that this activity be pursued with caution.

For instance, given the increase in complexity of computer and server systems and their increased dependence on and integration with other devices in a computer network, device specific energy efficiency requirements must be constructed with care. We have found that productivity and efficiency metrics do not scale easily. National energy efficiency programs such as ENERGY STAR have recognized the complexity inherent in ICT equipment, and accordingly have focused on a finite set of products and common system level attributes to assess and promote energy efficient designs. Even within a defined product type, product categories and test and classification methods are needed to take into account energy use growth associated with capability growth to ensure comparison of like-capable products. For client computers, industry specifications such as IEC 62623 define a method of categorizing or grouping like systems. As technology advances, the IEC standard allows for additions or updates to the categories. ENERGY STAR and other energy efficiency programs intend to use this standard to better define systems with like capabilities.

Certainly, a detailed market and computer and server capability assessment will be needed to determine whether useful opportunities exist and whether their benefits would exceed the benefits of fully deploying currently available efficiency drivers such as power management functions and virtualization capabilities. We also recommend the committee interact with the EPA ENERGY STAR Office to benefit from the extensive work done by that group to establish energy efficiency requirements for computers and servers. For example, evaluations or comparisons are only appropriate for a narrow well-defined group of products that share common characteristics and capabilities. The categorization method should follow ENERGY STAR practices. The assessment methods should focus on specific product subgroups with defined metrics relevant and common to the subgroup. We recommend focusing on only those sub categories of products where requirements will deliver material, demonstrable benefits over those currently available from existing power management and virtualization capabilities. With a narrow scope and well defined categories we hope to avoid unintended consequences to other product groups. Given the rapid development and evolving nature of the industry, the limited focus may also avoid unintended consequences impacting developing technologies, such as new computer types or categories.

Given a common focus on energy efficiency, we recommend harmonizing to existing or developing standards and evaluation methods. For specific client computer systems, the categorization and TEC methods serve as a good common base and are being adopted by EuP Lot3 and ENERGY STAR v6.0. For specific types of servers, a feature set scaled idle power is used by ENERGY STAR. Many organizations, including ENERGY STAR, recognize the need for a server energy efficiency tool suite, and are evaluating SERT™ from SPEC as a future harmonization point. Also recognize that ENERGY STAR is a voluntary program and targets just the top 25% of the market given the most stable/representative model at that time. To determine a regulation limit, we do NOT recommend using the aspirational ENERGY STAR limits on previous market assessment and groupings. Rather, we recommend conducting a full market assessment to focus on specific product types, with energy efficiency limits that target removal of products in the lowest 10% of the market.

All these points are captured by the Principles for Aligning Energy Efficiency Regulations for ICT Products that were endorsed by the U.S. Government and 21 other governments of APEC attending the high-level APEC meetings hosted by the U.S. last month in San Francisco. ITI strongly recommends that the CEC adhere to these principles in any regulatory activity regarding ICT products.

The seven APEC Principles state that governments, in coordination with industry and other stakeholders, should seek to do the following:

"Ensure energy efficiency programs for ICT products help promote, and not impede, energy efficient economic growth and innovation.

Economies should strive for design-neutral, performance-based standards and regulations that do not impede innovation, performance, or the quality of ICT products and their contribution to energy efficient growth and development in the APEC region.
Future sustainable economic growth and development will depend significantly on the ICT sector's ability to innovate. While the ICT sector seeks to increase the energy efficiency of its own products, the Climate Group's *Smart 2020* report found the largest energy benefits will occur by enabling greater efficiency in other sectors, an opportunity that could deliver carbon savings five times larger than the total emissions from the entire ICT sector in 2020.

Ensure energy efficiency programs for ICT products are based on accurate data and sound analysis.

APEC economies should undertake regulatory impact assessments before initiating voluntary or mandatory energy efficiency programs for ICT products. The marketplace is both complex and dynamic, and the ICT industry is a willing party in assisting with accurate data collection, product studies, impact assessments, and resulting analyses.

Use proven successful voluntary and mandatory energy efficiency programs for ICT products as a basis for regulatory convergence and product energy efficiency gains.

Under voluntary programs, manufacturers that offer energy efficiency products are rewarded by the market, due to increased sales of their products to customers that desire the most energy efficient products. Voluntary and mandatory programs or elements of them, in Australia, Canada, China, Hong Kong China, Japan, Korea, New Zealand, and the United States have a good record of achieving energy efficiency goals in the economies in which they were set, and serve as an excellent basis for work towards further convergence. Economies should look to implement voluntary requirements as a first choice, and if these do not meet needs and resources, then explore mandatory measures.

Avoid using voluntary energy efficiency program metrics as minimum energy performance standards (MEPS) for market access of ICT products.

Minimum energy performance requirements normally aim to remove the least energy efficient products from the marketplace, whereas voluntary market incentive programs normally aim to promote the best. Adoption of voluntary program metrics as MEPS is therefore to be avoided, as otherwise they will constrain ICT product manufacturers from fulfilling customer needs when higher performance products that use more energy are required.

Adopt international standards and metrics in energy efficiency programs for ICT products.

Producers and users of ICT products benefit from internationally accepted standards to help them maximize product value in APEC economies. APEC can provide an opportunity for further alignment by promoting greater adoption or harmonization with international standards among the APEC economies, and by encouraging more active participation in international standards development settings. Included in this effort should be agreement to a common product category system, as defined in IEC 62623.

Ensure transparency and stakeholder participation in the regulatory process for energy efficient ICT products.

Mechanisms should be in place to enable early and continuing engagement of stakeholders. An appropriate period of time should be included in the planning, development, and implementation of energy efficiency programs impacting ICT products. The development process should facilitate transparency with, and participation from, interested stakeholders.

Adopt minimally trade-restrictive conformity assessment requirements in energy efficiency programs for ICT products.

APEC economies are encouraged to adopt principles for conformity assessment which offer a means to meeting program objectives without creating unnecessary obstacles to trade, and to use international systems of conformity assessment wherever practicable, as required by Article 5 and Article 9 of the WTO TBT Agreement."

Finally, please note that the 2nd APEC Principle on accurate data and sound analysis is of great importance to ITI, and serves as a basis for our decision to recently reach out to other stakeholders following the CEC's September Workshop.   ITI has concerns that some of the recommendations presented at the Workshop do not meet this threshold.

More specifically, presentations were made suggesting a 2.5TWhr savings opportunity on client computers and 0.8TWhrs for servers. Though we may question the source and magnitude of the savings, there is no evidence that regulating client computers TEC values or tightening its multi-output supply efficiency would gain that improvement. On the contrary, the limits on multi-output power supplies may have reached its economic viability. The product scope is also in question, as the current TEC methods are applicable to select grouping of product and was determined after evaluation of specific product group and usage model. For servers, hardware productivity improvements and power management adoption in the data center are also end-user dependent.

The variations in applications, reliability, availability, and serviceability, and supporting business requirements define the configurations and architectures. The variety of "possible" regulation methods is indicative of the variance in applications and configurations. Efficiency gains will vary and will be highly dependent on the performance metric, application and usage model. For example, using a particular architecture and configuration may show efficiency gains in an internet portal data center but may be highly inefficient for retail commerce. If for a specific segment of servers, such as 1-2S rack servers, we find that more efficiency gains (reduced energy footprint) can be attained via a refresh and consolidation activity, where a four year oldplus server fleet can be reduced by over 5x. The difficulty is in getting users to turn off and replace servers and not the percentage reductions in new system purchases.

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